Long Range Model 2 - Grade 8

STRAND A: STEM Skills and Connections	A1.1 Scientific Research	A1.2 Scientific Experimentation	A1.3 Engineering Design	A1.4 Safety	A1.5 Communication	A2. Coding and Emerging Technologies	A3. Applications Connections and Contributions

A1. STEM Investigation and Communication Skills: use a scientific research process, a scientific experimentation process, and an engineering design process to conduct investigations, following appropriate health and safety procedures

A1.1 use a scientific research process and associated skills to conduct investigations

A1.2 use a scientific experimentation process and associated skills to conduct investigations

A1.3 use an engineering design process and associated skills to design, build, and test devices, models, structures, and/or systems

A1.4 follow established health and safety procedures during science and technology investigations, including wearing appropriate protective equipment and clothing and safely using tools, instruments, and materials

A1.5 communicate their findings, using science and technology vocabulary and formats that are appropriate for specific audiences and purposes

A2. Coding and Emerging Technologies: use coding in investigations and to model concepts, and assess the impact of coding and of emerging technologies on everyday life

A2.1 write and execute code in investigations and when modelling concepts, with a focus on creating clear and precise instructions for simple algorithms

A2.2 identify and describe impacts of coding and of emerging technologies on everyday life

A3. Applications, Connections, and Contributions: demonstrate an understanding of the practical applications of science and technology, and of contributions to science and technology from people with diverse lived experiences

A3.1 describe practical applications of science and technology concepts in their home and community, and how these applications address real-world problems

A3.2 investigate how science and technology can be used with other subject areas to address real-world problems

A3.3 analyse contributions to science and technology from various communities

Overview:

Big Idea: Water Environmental, Economic and Social Impacts

Students will assess the importance of water, and consider the impact of environmental, economic and social impacts on the environment as well as innovative technologies introduced in response to these impacts

Strands & Expectations (in addition to the Strand A expectations listed at the beginning of this document):
Students integrate learning from Strand A as they investigate concepts, develop and apply skills, and make meaningful connections to their lives and communities.

Strand C: Matter and Energy
C1. Relating Science and Technology to Our Changing World: analyse uses of various technologies that rely on the properties of fluids, and assess the impact of these technologies on society and the environment
C2. Exploring and Understanding Concepts: demonstrate an understanding of basic fluid mechanics, including the properties and uses of fluids

Strand D: Structures and Mechanisms
D2. Exploring and Understanding Concepts: demonstrate an understanding of different types of systems and the factors that contribute to their safe and efficient operation

Strand E: Earth and Space Systems
E1. Relating Science and Technology to Our Changing World: assess the impact of human activities and technologies on the sustainability of water resources
E2. Exploring and Understanding Concepts: demonstrate an understanding of the characteristics of Earth's water systems and of factors that affect these systems

Month or Suggested Timeline	STEM Skills and Connections	Guiding Questions	Cross-Curricular Integration	Resources	First Steps & Next Steps
September October	(?) **A1.1** Students conduct research on various water contaminations throughout Canada and locally. Examples: Students will research Indigenous drinking water advisories, historic fuel spill contaminating Nunavut water treatment tank, and the Walkerton tragedy	How is water filtered naturally? How is local water contaminated? What are some examples of contaminants? How is local water treated? Where are the local watersheds? Do you have any local freshwater	**Geography**: Online Mapping Tools to research local water **History**: Indian Act, United Nations Declaration on the Rights of Indigenous Peoples, Truth and Reconciliations Calls to Action	STAO Safety in Elementary Science and Technology UNDRIP Drinking water advisories. Water crisis in Nunavut Science North - Gr. 7/8	**Planning Considerations:** Adjust scientific experimentation and engineering designs accordingly, depending on availability of equipment and resources: Find a local water source that students can either walk to or the teacher can access to bring pictures and/or a

	A1.1 Students conduct research on various areas around Canada where there is fresh, clean drinking water Example: In British Columbia, there is currently fresh, clean drinking water on Wet'suwet'en territory where a pipeline is being built. How will this pipeline affect clean drinking water? **A1.2** Students use experimentation to compare the viscosity and density of water to other fluids **A1.2** Students use experimentation to simulate the melting of the polar ice caps using a water table activity **A1.2** Students take a walk to a local water source and record observations of contaminants. Notes: Students can use a clipboard with a worksheet already created with vocabulary to support their learning. Alternatively,	locations where the water is clean and free of contaminants?	**Media Literacy** Review Unist'ot'en website. **Mathematics**: Solve equations that involve multiple terms such as D=m/V **Language** Create a presentation on student's findings Write a letter to municipal, federal and provincial government officials advocating for the right of clean water for all. Also, advocating for the protection of water. **Skilled Trades** Use a comprehensive education and career/life planning program (i.e. myBlueprint) to determine possible related jobs (projected income, required education, student's fit for the role following completion of surveys, etc.). Examples include water treatment technicians, plumbers, pipefitters, etc. **Connection to Skilled Trades:** Invite local technicians to the class (in person or virtually)	Ozobot Challenges p30-36 (Cells: Removing waste from a cell) Scratch - Clean Water for All How do melting polar ice caps affect sea levels? Science North - Gr. 7/8 Ozobot Challenges (p44-50: Viscosity) - Adjust the speed of the Ozobot depending on the viscosity of the liquid Science North - Gr. 7/8 Ozobot Challenges (p51-57: Water Systems and water treatment) - program the Ozobot to follow the journey of water through a water system Other related careers are found at bottom of this Let's Talk Science page as well as at careersintrades.ca Sphero - Ugandan water crisis. Create a program that will recognize when Sphero is lifted off the ground with a pulley	sample to the classroom to carry out microscope work. Alternatively, contact a local facility to arrange a class field trip for water sampling and/or observation. This should be done early in the school year to ensure any living microorganisms are viable. In-class experiments on viscosity and density can be carried out using liquids of different viscosities as well as density blocks. Students will look for evidence of living things, rather than identifying them as plants or animals which will occur in April and May. The main focus is proper handling and use of the microscope using a wet mount slide. If designing a well to provide clean water, this would be a good introduction to pulleys. Some students may be on a well system at their homes and an extension may be to have them find out how their water is treated vs a municipal water system. If building a water filtration

	students can bring their Chromebooks. A suggestion for safety would be to have students carry their Chromebooks in their backpacks. **A1.4** During the walk students are reminded to respect nature, not disturb their environment, and make observations only. Water safety reminders apply here as well. **A1.2** Students use experimentation to conduct an investigation of a local water source and use a microscope to identify the diversity of living microorganisms as an indicator of a healthy water environment For example, students will take a sample from their local water source and make observations of their investigation, using a microscope, through words or pictures. Notes: Some considerations if there is a lack of nearby water sources would be to find a video to show the class. Also, if microscopes are		Examples: ● Wastewater treatment technician (both on reserve and off if possible) ● Professor at a local post-secondary institution who specializes in wastewater treatment ● Well water treatment technician For example, students create questions to ask during an interview (and possibly host an actual interview). Possible assessment of questions students create as a consolidation of learning.	system Ocean health monitor project and oil spill clean-up project. micro:bit lesson on healthy oceans	device, make sure to collect a class set of containers such as plastic water bottles ahead of time. Or, if available, mason jars to eliminate possible plastic waste Educators create an inclusive learning environment by attending to students with special needs, providing choice as well as grouping students when appropriate. **Investigation and Design Materials:** Water Filtration Device (water bottle, sand, rocks, charcoal, and other filtering materials) Microscope and safety rules (glass slides, eyedroppers, microorganism charts or websites for reference only) **Other considerations:** Who are your treaty partners? Local water source treatment: Wastewater Treatment Facilities? Well water treatment? **Who to contact?** ● Outdoor Ed facilities to run water sample demonstrations/ watershed demonstrations

	unavailable, students can still observe and make notes of their observations of contaminants.  **A1.4** Students will be reminded of proper handling of the microscope  **A1.1** Students use research to answer the question: “What materials would you need to build a water filtration device?” How can we make the device without using plastic materials? Example: Many sites will suggest using a 2L plastic water bottle but glass jars can be substituted and reused with other classes.  **A1.3** Students use an engineering design process to construct a water filtration device based on their learning so far. Notes: Teachers can model the engineering design process for students or have students conduct research online to construct the water filtration device. Some				• Local conservation authorities • Local MPPs, federal and provincial government officials • Ministry of Environment • Board Indigenous Education Leads to help make connections to local treaty partners • Local colleges to make connections to skilled trades

	considerations to note are having students work in groups for peer support and the sharing of resources. **Extension**: Water contaminants around the world (see Sphero - Ugandan water crisis link in the Resources column).  **A 1.5** Communicate observations and conclusions of water filtration devices through a wide range of presentation techniques. For example, assessment opportunities can be included to offer students a wide variety of presentation options (WeVideo, Google Slides, paper and pencil, etc.). Students can be assessed on their knowledge of contaminants locally as well as around Canada and the world along with the importance of clean water.  **A2.1** Students will model concepts, on water systems by making a prototype that monitors ocean health and write and execute code when designing an				

	efficient algorithm to clean water using micro:bit coding that aligns with UN's Global Goals.  **A3.2** Investigate local water treatments. For example, investigate local wastewater treatment facilities, septic systems, or how well water is maintained and monitored. Notes: Teachers can make connections here to previous learning on The Walkerton tragedy. Also, teachers can make connections to building wastewater treatment facilities on reserves. **Extension Questions:** Are there wastewater treatment facilities on local reserves? How do local reserves access clean drinking water? The United Nations declared clean drinking for all, is this accurate?				

Overview

Big Idea: Water and innovative technologies

In response to climate change and sustainability issues, students will investigate desalination technologies. Students will design their own innovative water technologies and communicate their findings.

Strands & Expectations (in addition to the Strand A expectations listed at the beginning of this document):

Students integrate learning from Strand A as they investigate concepts, develop and apply skills, and make meaningful connections to their lives and communities.

Strand B: Life Systems
B2. Exploring and Understanding Concepts: Demonstrate an understanding of the basic structure and function of plant and animal cells and cell processes

Strand C: Matter and Fluids
C2. Exploring and Understanding Concepts: Demonstrate an understanding of basic fluid mechanics, including the properties and uses of fluids

Strand D: Structures and Mechanisms
D1. Relating Science and Technology to Our Changing World: assess the social and environmental impacts of various systems, and evaluate improvements to the systems or alternative ways of meeting the same needs
D2. Exploring and Understanding Concepts: Demonstrate an understanding of different types of systems and the factors that contribute to their safe and efficient operation

Strand E: Earth and Space Systems
E1. Relating Science and Technology to Our Changing World: Assess the impact of human activities and technologies on the sustainability of water resources

Month or Suggested Timeline	STEM Skills and Connections	Guiding Questions	Cross-Curricular Integration	Resources	First Steps & Next Steps
November	**A1.1** Students conduct research to compare freshwater vs. saltwater including the differences in density and buoyancy **A1.1** Students conduct research to answer the question: ” What would you need to build a saltwater circuit and/ or water desalination plant?” **A 1.3** Students use an engineering design process to build a saltwater circuit. Students learn about the conductivity of	Where do we find salt water in Canada? In other parts of the world? Where do we find our freshwater sources in Canada? In other parts of the world? How do desalination technologies help to solve our current global water sustainability crisis?	**Mathematics** Create a scale drawing of the saltwater circuit and/or water desalination plant **Geography** Examine and create thematic maps related to settlement patterns and discuss changes to the physical environment that might impact settlement in the future Analyse how processes related to the physical environment may affect human settlements in the future (i.e. the impact of rising sea levels on coastal cities as polar ice caps melt; the	Teachers can model or students can use this site for ideas Cartesian diver Saltwater circuit - Students learn about the conductivity of saltwater and that the amount of salt in a solution impacts the amount of conductivity. How do we reduce our water footprint. Do you know the water footprint of your cup of coffee? water footprint calculator	**Planning Considerations:** Adjust scientific experimentation and engineering designs accordingly, depending on the availability of equipment and resources. Contact a local water conditioning company or hardware store to arrange for a technician to interview or visit to explain the reverse osmosis drinking water system Complete the water footprint exercise early on to allow students to have more time to reflect and be able to show

	saltwater and that the amount of salt in a solution impacts the amount of conductivity and/ or desalination plant. Notes: The materials for this EDP are extensive. Possible solutions would be to model this, have students work in groups, and/ or observe this EDP process from the video and complete reflection questions. **A 1.4** Students should follow these safety precautions when building this circuit**.** Have students use goggles or safety glasses for eye protection. If not using a battery cap, it is easy to short circuit the battery if the wire ends that are connected to the positive and negative terminals of the battery touch. If they touch, the battery overheats and can cause severe burns. **A1.5** Communicate observations and conclusions of their circuit and/ or desalination plant findings through oral		impact of increasingly violent tropical storms as a result of climate change) In an infographic, describe possible features of a sustainable community in the future and analyse some challenges associated with creating such a community **Language** Research uses of fresh water and/or water footprint of everyday items Discuss how we could reduce our water footprint. Analyse Infographics about freshwater and saltwater. **Skilled Trades** Use a comprehensive education and career/life planning program (i.e. myBlueprint) to determine possible related jobs (projected income, required education, student's fit for the role following completion of surveys, etc.). Examples include well-drilling technicians, water treatment field technicians, welders, etc.	Canadian Geographic Water infographic. Other related careers are found at careersintrades.ca Ocean Water Desalination activity (change language to French in the top toolbar)	evidence of how to improve their water footprint Review the materials for the saltwater circuit and desalination investigations (there is a lengthy list of materials to collect; this may also be done as a demonstration if equipment is limited) Educators create an inclusive learning environment by attending to students with special needs, providing choice as well as grouping students when appropriate. **Investigation and Design Materials:** Saltwater circuit (varies) Desalination technologies **Other Considerations: Who to contact?** • Water conditioning technician • Outdoor Ed facilities to run water sample demonstrations • Local conservation authorities • Local MPPs • Ministry of Environment • Board Indigenous

	presentations, videos, and diagrams **Extension**: Assessment possibility would be for students to explain why this technology is important.  **A2.2** Students will identify and describe the impacts of coding and of emerging technologies by looking at techniques of ocean desalination as a system with inputs, components, and outputs.  **A.3** **Students will investigate the following questions:** Where are the local freshwater sources? Why is it important to protect local fresh water? What are members of your community doing to protect local fresh water?  **A3.1** Inquiry: create questions to ask a reverse osmosis water filtration technician during an interview (and possibly host an actual interview). Host a guest speaker to present about the role.				Education Leads to help make connections to local treaty partners • Local colleges to make connections to skilled trades (demonstrate reverse osmosis technologies)

Big Idea: Water Environmental and Social Impacts
Students will investigate a diverse range of perspectives when comparing the importance of land and water use to economic developments. Students will communicate through investigation of the impact of human activity on the environment as well as innovative technologies introduced in response to these impacts.

Strands & Expectations (in addition to the Strand A expectations listed at the beginning of this document):
Students integrate learning from Strand A as they investigate concepts, develop and apply skills, and make meaningful connections to their lives and communities.

Strand C: Matter and Fluids
C1. Relating Science and Technology to Our Changing World: Analyse uses of various technologies that rely on the properties of fluids, and assess the impact of these technologies on society and the environment

Strand D: Structures and Mechanisms
D2. Exploring and Understanding Concepts: Demonstrate an understanding of different types of systems and the factors that contribute to their safe and efficient operation

Strand E: Earth and Space Systems
E1. Relating Science and Technology to Our Changing World: Assess the impact of human activities and technologies on the sustainability of water resources
E2. Exploring and Understanding Concepts: Demonstrate an understanding of the characteristics of Earth's water systems and of factors that affect these systems

Month or Suggested Timeline	STEM Skills and Connections	Guiding Questions	Cross-Curricular Integration	Resources	First Steps & Next Steps
December January February	(?) **A1.1** Students conduct research on local current developments that impact the environment Examples: • Proposed Hwy 413 through York, Peel, and Halton regions • Current pipeline protests in BC on Indigenous territory	What are some current developments occurring locally? What are some major developments occurring globally that have significant impacts on the environment? Who benefits from development? How do innovative technologies lessen the environmental impact of development? What are the opinions of this development from local community	**Geography**: Use online Mapping Tools to research the Greenbelt, current development as well as future development. **History**: Analyse some of the challenges facing different individuals, groups, and/or communities in Canada between 1890 and 1914, and compare some of these challenges with those facing present-day Canadians (i.e.	Stop The 413 Pipeline in BC UNDRIP Lab activity: National Geographic Oil spill cleanup. UN SDG #6 - Clean water and sanitation Hour of Code UN SDGs (Life on Land)	**Planning Considerations:** Adjust scientific experimentation and engineering designs accordingly, depending on availability of equipment and resources. Initiate contact and collect information on persons in related development careers (e.g. parents) early to allow time for approval for students to carry out interviews focusing on local development

	 **A1.1** Example: Where is your local watershed? **Extension:** Invite a guest from a local outdoor education location to come in to do a live demonstration.  **A 1.3** Students use an engineering design process to build a model that represents the projected highway and includes all local watersheds Students can create a model using materials such as a shoe box, construction paper, popsicle sticks, etc. with rivers, creeks, etc. that flow into the local watershed(s). Students will be able to visually see the impact of construction on local watersheds.  **A1.3** Students use an engineering design process to build a more sustainable or environmentally friendly form of transportation Example: Students will build a	members? How does this development impact farmers, local reserves, businesses, homes, etc.?	increasing industrialization) - Create a Heritage Minute (live or recorded) that combines the two eras. **History**: Indian Act, United Nations Declaration on the Rights of Indigenous Peoples, Truth and Reconciliations Calls to Action **Language**: Create a poster or presentation to promote awareness of the importance of watersheds and maintaining freshwater sustainability **Mathematics:** Graphing using data from experiments (independent and dependent variables) - **Skilled Trades** Use a comprehensive education and career/life planning program (i.e., myBlueprint) to determine possible related jobs (projected income, required education, student's fit for the role following completion of surveys, etc.). Examples	Other related careers are found at careersintrades.ca Mousetrap car building instructions Using a micro:bit-oil spill cleaner-upper.	Oil spill cleanup could be a fictional locally designed activity There are several options for coding in this section on innovative transportation which would complement one or more of the investigations or engineering processes Order materials early for any of the environmentally friendly forms of transportation kits mentioned if not using mousetraps Educators create an inclusive learning environment by attending to students with special needs, providing choice as well as grouping students when appropriate. **Investigation and Design Materials:** Building a model using computer software Build a sustainable or more environmentally friendly form of transportation. Kits are available online for purchase if not making from makerspace materials.

	sustainable or more environmentally friendly form of transportation (e.g. mousetrap-powered car, solar-powered car, wind-powered car etc.)  **A1.5** Students will communicate their observations and conclusions of their model and explain how this will affect ecosystems, watersheds, and species.  **A2.1** Students will write and execute code by building the code for an autonomous vehicle to mop up oil spills with the option to build a prototype using micro:bit-oil spill cleaner-upper.  **A3.2** Students will answer the questions: Were local Indigenous communities consulted on the development process? Were The United Declaration of the Rights of Indigenous people Article 23, Article 26, Article 29, Article 32, Article 37 upheld?		include environmental field technicians, automotive service technicians, bus operators, heavy equipment technicians, electric motor service technicians, transport truck operators, transport truck mechanics, etc. **Art:** The Onama Collection is a collection of artwork that can be used to raise awareness for the urgent need for water protection. Students can also colour the posters.		**Other Considerations:** **Who to contact?** ● Outdoor Ed facilities to run water sample demonstrations ● Local conservation authorities ● Local MPPs ● Ministry of Environment ● Board Indigenous Education Leads to help to make connections to local treaty partners ● Local colleges to make connections to skilled trades

	A3.1 Inquiry: create questions to ask someone in a related career (e.g. a civil engineer working in the construction of highways or a mechanical engineer working on sustainable transportation) during an interview (and possibly host an actual interview) Host a guest speaker to present about the role.				

Overview

Big Idea: Food Security Environmental and Social Impacts
Students will investigate local food sources and consider the impact of climate change, social and economic development on food security.
Students will communicate through investigation of the impact of human activity on the environment as well as innovative technologies introduced in response to these impacts.
Students will communicate an understanding of various irrigation systems, fluid mechanics, and the impact of these technologies on the environment.
Students will communicate an understanding of the environmental impacts of building dams and through investigation, will demonstrate an understanding of improvements to these systems.

Strands & Expectations (in addition to the Strand A expectations listed at the beginning of this document):
Students integrate learning from Strand A as they investigate concepts, develop and apply skills, and make meaningful connections to their lives and communities.

Strand B: Life Systems
B1. Relating Science and Technology to Our Changing World: Assess developments in cell biology and their impact on individuals, society, and the environment
B2. Exploring and Understanding Concepts: Demonstrate an understanding of the basic structure and function of plant and animal cells and cell processes

Strand C: Matter and Energy
C1. Relating Science and Technology to Our Changing World: Analyse uses of various technologies that rely on the properties of fluids, and assess the impact of these technologies on society and the environment
C2. Exploring and Understanding Concepts: Demonstrate an understanding of basic fluids mechanics, including the properties and uses of fluids

Strand D: Structures and Mechanisms
D1. Relating Science and Technology to Our Changing World: Assess the social and environmental impacts of various systems, and evaluate improvements to the systems or alternative ways of meeting the same needs
D2. Exploring and Understanding Concepts: Demonstrate an understanding of different types of systems and the factors that contribute to their safe and efficient operation

Strand E: Earth and Space Systems
E1. Relating Science and Technology to Our Changing World: Assess the impact of human activities and technologies on the sustainability of water resources
E2. Exploring and Understanding Concepts: Demonstrate an understanding of the characteristics of Earth's water systems and of factors that affect these systems

Month or Suggested Timeline	STEM Skills and Connections	Guiding Questions	Cross-Curricular Integration	Resources	First Steps & Next Steps
March April	**A1.1** Students conduct research on local plants and food sources Example: Wild Rice, Atlantic Salmon, Strawberries, Blueberries, etc. **A1.1** Students conduct research on the life cycles of the Atlantic Salmon/ Harvesting Wild Rice and the need to build structures to assist with migration. **A1.3** Students use an engineering design process to build a fish ladder or a hydroponic system Notes: This activity can also be connected to simple	What are the local food sources that are native to the land? How has climate change and economic development (ie. dams) impacted our food insecurities? What has happened to the pollinator (ie. honeybees) population? Why is this so important? How has this impacted food security? What are some local examples of innovations in response to these impacts (ie community gardens, pollinator gardens, etc.) How has automation of the food industry changed how we manage our food sources and make them more sustainable year-round? What is the community and/ or local Indigenous community doing	**The Arts:** Students will engage actively in drama exploration and role play, by examining multiple stakeholder perspectives and possible outcomes related to automation of the food industry Students can role play in this game to understand the challenges that Atlantic Salmon face **Mathematics:** Use mathematical modeling to represent, analyse, make predictions and provide insight into real-life situations by collecting data on local food sources and life cycles of Atlantic Salmon Look at how to maintain a balanced budget buying local	Example: Students can watch this video for an understanding of harvesting wild rice James Whetung: Harvesting Wild Rice. Experience life cycle of a salmon Minecraft - Create a crop farm - Students will follow the build instructions to create a crop farm in Minecraft Teachers and students can use this site for ideas Irrigation Ideas - TryEngineering.org Powered by IEEE Other related careers are found at careersintrades.ca	**Planning Considerations:** Adjust scientific experimentation and engineering designs accordingly, depending on availability of equipment and resources. Local food sources at this time of year will be limited and should include provincial or national sources; this topic is reexamined in April/May when more local sources may be available. An excellent opportunity in this section is to book an expert guest speaker (e.g. apiarist, conservationist, naturalist) If using a microcontroller to code an irrigation system, make sure to have kits or

	machines (ladder-inclined plane) and the mechanical advantage of these structures. Students can compare the efficiency, monetary cost, environmental costs, and social impacts of these structures.  **A1.3** Students use an engineering design process to design and compare prototypes of an innovative irrigation system that is based on the properties of fluids composed of simple machines.  **A1.2** Students use experimentation to investigate how automation in the food industry has impacted the environment and society from the point of view of various stakeholders  **A1.5** **Communication:** Field trip/ Neighborhood walk Example: Record observations of plant and food sources locally.	to help revitalize local food sources?	food sources. **Geography:** Create an ideal city/country: If you could establish a settlement anywhere in the world, where would it be? What criteria would you use to select the location? Analyse and discuss some of the ways in which the physical environment has influenced settlement patterns in different countries and/or regions around the world Analyse, discuss and construct various print and digital maps as part of their investigation into issues related to the interrelationship between human settlement and sustainability, with a focus on investigating the spatial boundaries of the issue **Skilled Trades** Use a comprehensive education and career/life planning program (i.e. myBlueprint) to determine possible related jobs (projected income, required education, student's fit for the role following completion of surveys, etc.). Examples include apiary technician,		materials available as a class set or demonstration Use one of the available online activities to build a fish ladder ● - hydraulic and pneumatic systems lead nicely into developing an irrigation system ● -hydroponic kits are available but starting with collecting either seeds, cuttings, tops of vegetables or fruits works well Educators create an inclusive learning environment by attending to students with special needs, providing choice as well as grouping students when appropriate. **Investigation and Design Materials:** Fish ladder (online) Hydroponic systems Irrigation systems using microcontroller **Other Considerations:** **Who to contact?** ● Outdoor Education facilities to run hikes and discuss local plants and animals ● Local conservation

	 **A2.1** Students will model or code an innovative auto seed planting or watering system to identify and describe emerging technologies.  **A3.3** **Students can research the following questions:** Who are your local treaty partners? How are they trying to revitalize local food sources? How is the local community trying to revitalize local food sources? Which non-native foods are being grown locally? How are greenhouse innovations being used to assist with local food demands?  **A3.1** Students can create questions to ask someone in a related career (i.e., marine biologist; hydroponic farmer; local farmer) during an interview (and possibly host an actual interview). Host a guest speaker to present about the role		machinist, horticulturist, industrial electrician, laborer, etc.		authorities ● Local MPPs ● Ministry of Environment ● Board Indigenous Education Leads to help make connections to local treaty partners ● Local colleges to make connections to skilled trades ● Local apiaries

	A3.2 **Applications, Connections, and Contributions**: Discuss, “even if extinct species are reintroduced, are they safe to consume?” Investigate local contaminants/ pollutants and their effects on local ecosystems				

Overview

Big Idea: Innovative Technologies in Cell Biology as it relates to Food Security
In response to climate change, students will investigate cells and innovative technologies created to address sustainability. Students will examine developments in cell research including how gene technology has affected industries such as farming, human health, and food security.

Strands & Expectations (in addition to the Strand A expectations listed at the beginning of this document):
Students integrate learning from Strand A as they investigate concepts, develop and apply skills, and make meaningful connections to their lives and communities.

Strand B: Life Systems
B1. Relating Science and Technology to Our Changing World: Assess developments in cell biology and their impact on individuals, society, and the environment
B2. Exploring and Understanding Concepts: Demonstrate an understanding of the basic structure and function of plant and animal cells and cell processes

Strand D: Structures and Mechanisms
D2. Exploring and Understanding Concepts: Demonstrate an understanding of different types of systems and the factors that contribute to their safe and efficient operation

May **June**	**A1.1** Students conduct research on the effect of a technology that has affected the food industry (e.g., pest-resistant crops, farmed fish). **A1.1**	How have recent advances in cell research advanced our understanding of human health/ food security? What are some different perspectives (e.g. that of farmers and consumers) that need to be taken into consideration with advancements in cell research?	**The Arts** Apply the creative process to produce a cell model in a three-dimensional form **Language** Prepare and deliver presentations on investigations, research, and	UNSDG #3 - Good Health and Well Being TinkerCAD Other related careers are found at careersintrades.ca Hour of Code Climate Activities	**Planning Considerations:** Adjust scientific experimentation and engineering designs accordingly, depending on availability of equipment and resources: -be aware of bias when students are researching innovative technologies

	Students conduct research on how gene technology has altered both animal and plant cells and examine the advantages and disadvantages of these processes through different community stakeholders  **A1.2** Students use experimentation to find and observe components of plant and animal cells; under a microscope, use live or prepared slides of unicellular organisms such as a protist to examine how they obtain their basic needs  **A1.2 Scientific Experimentation:** Students use experimentation to investigate how people are adapting to climate change and/or their settlement location in the world in order to grow food (i.e., shipping container greenhouses in Nunavut; vertical farming)  **A1.5** Research a disease caused by microorganisms or malnutrition, and its treatment	How might we consider both the advantages and disadvantages of this type of research to society and the environment?	work related to a 3D model of a plant or animal cell **History** (1890-1914) - identify key social and economic changes that occurred in and/or affected Canada during this period and explain the impact of some of these changes on various individuals, groups, and/or communities (i.e., technological changes) - Create a Heritage Minute (live or recorded) that combines the two eras. **Geography** After researching a disease and its treatment for a condition caused by microorganisms or malnutrition, prepare a presentation using Google My Maps or Google Earth that shows the level of global development and quality of life in these areas. Evaluate evidence and draw conclusions about issues related to global development and quality of life **Mathematics** Use mathematical modeling to represent, analyse, make predictions and provide		especially when looking at cell research -provide students with specific gene technologies to research to provide a balance of advantages and disadvantages - give students time to collect materials for their 3D cell to be creative - if using live protists order them to arrive on a specific date; protozoa can be collected directly from water of cut plants - provide a list of diseases that are caused by microorganisms or malnutrition to ensure grade appropriate research - focus on a global perspective when investigating how climate change has changed how food is grown -Educators create an inclusive learning environment by attending to students with special needs, providing choice as well as grouping students when appropriate. **Investigation and Design Materials:** Microscopes Prepared and live microscope slides (to compare plant and

	and communicate findings through a presentation.  **A1.3** Students use an engineering design process to build a 3D model of an animal or plant cell.  **A1.1** Students conduct research on how cell research has advanced a particular structure or cell using sourced materials or computer software (e.g., stem cells or gene splicing)  **A1.5** Visit a local grocery store and farmer's market to compare food sources and the use of pesticides/genetically modified food  **A2.2** Students will identify and describe impacts of coding and of emerging technologies by engaging in an interactive tutorial about climate change using Hour of Code activities.		insight into real-life situations by collecting data on the number of microorganisms in a local water source and graphing the results. Inquiry: Research the cost of food in Northern Communities (ie. Nunavut) and compare the cost of food locally. Determine the factors that contribute to the food insecurities up North. **Skilled Trades** Use a comprehensive education and career/life planning program (i.e. myBlueprint) to determine possible related jobs (projected income, required education, student's fit for the role following completion of surveys, etc.). Examples include farmers, aircraft mechanics, agricultural equipment operators, nursery and greenhouse managers, tool and die makers, etc.		animal cells) Creative materials to represent parts of cells or computer software for creating 3D cell model **Other Considerations:** **Who to contact** ● Local food sources ● Local farmers ● Local scientists (i.e., geneticist) ● Pesticides/Herbicide/Fertilizer Company representatives ● Local public health units ● Colleges and University involved in cell research

	 **A3.3** Who are your local treaty partners? How are they trying to revitalize local food sources?  **A3.1** Inquiry: create questions to ask someone in a related career (e.g. geneticist; fish farmer; local farmer; pesticide, herbicide, or fertilizer company representative) during an interview (and possibly host an actual interview) Host a guest speaker to present about the role.				